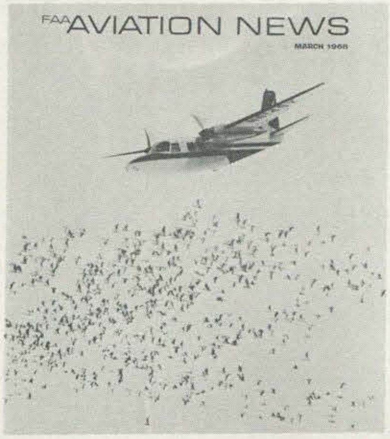
FAA AVIATION NEWS

MARCH 1968



COVER

Birds on the wing are a sign of spring—and sometimes a hazard to aircraft. See page 8.

FAA AVIATION NEWS

DEPARTMENT OF TRANSPORTATION **FEDERAL AVIATION ADMINISTRATION** VOL. 6 NO. 11

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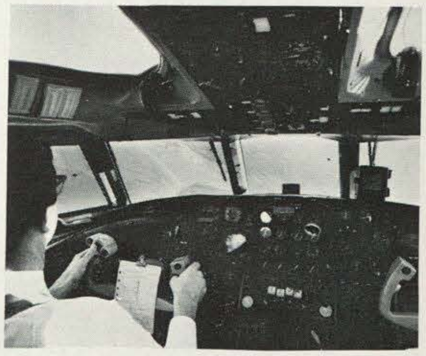

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"SPECIAL VFR" RESTRICTED

Major changes in the regulation which permits special visual flight rule (VFR) operations in airport control zones when the visibility is as low as one mile and pilots can remain clear of clouds have been announced by the Federal Aviation Administration.

Effective April 30, 1968, special VFR operations of fixed-wing aircraft will be banned in the control zones of 33 major airports. The ruling affects only *special* VFR operations—those conducted under less than basic VFR weather minimums. Normal VFR operations may be conducted in all airport control zones when pilots have three miles minimum visibility and can remain at least 2,000 feet laterally from, 1,000 feet above and 500 below clouds.

Special VFR operations will still be permitted in the control zones of other airports served by a radar-equipped control tower, but landing and takeoff priorities at these airports will be given to aircraft operating under instrument flight rules (IFR).

In airport control zones not served by radar, special VFR operations will be permitted only when IFR operations are not being conducted.

The FAA action was based on a Notice of Proposed Rule Making (Notice 67-45) issued last October. The proposal, which would have eliminated special VFR operations by fixed-wing aircraft completely, drew approximately 3,000 comments from all segments of the aviation community.

Many of the commentators recognized that special VFR operations should be prohibited or limited at certain high density traffic locations. However, the complete elimination of special VFR was almost uniformly considered to be a drastic and unjustifiable action.

Comments typically emphasized that many users rely on obtaining a special VFR clearance to operate in control zones which are adjacent to uncontrolled airspace, where the basic VFR minimums are lower than those for controlled airspace—one mile visibility and clear of clouds. They maintained that this type of operation is a convenient and efficient way to fly during periods of reduced visibility, and is compatible with simultaneous IFR operations in most circumstances.

Additionally, comments from many business related aviation activities stated that they are dependent on this type of operation, and they would suffer a severe economic penalty if special VFR were eliminated.

As a result of further study—taking into consideration such factors as availability of radar, proximity of other airports, frequency of instrument weather conditions—FAA concluded that special VFR operations should be eliminated at certain locations and ATC procedures modified to ensure safe and efficient use of the airspace where these operations may continue.

Airports in whose control zones special VFR will be prohibited follow:

1. Atlanta, Ga. (Atlanta Airport)
2. Baltimore, Md. (Friendship)
3. Boston, Mass. (Logan)
4. Buffalo, N. Y. (Greater Buffalo)
5. Chicago, Ill. (O'Hare)
6. Cleveland, Ohio (Cleveland-Hopkins)
7. Columbus, Ohio (Columbus Municipal)
8. Covington, Ky. (Greater Cincinnati)
9. Dallas, Tex. (Love Field)
10. Denver, Colo. (Stapleton Municipal)
11. Detroit, Mich. (Wayne County)
12. Honolulu, Hawaii (Honolulu Int.)
13. Houston, Tex. (William P. Hobby)
14. Indianapolis, Ind. (Weir-Cook)
15. Kansas City, Mo. (Kansas City Muni.)
16. Los Angeles, Calif. (L. A. Int.)
17. Louisville, Ky. (Standiford Field)
18. Memphis, Tenn. (Metropolitan)
19. Miami, Fla. (Miami Int.)
20. Minneapolis, Minn. (Minn.-St. Paul)
21. Newark, N. J. (Newark Airport)
22. New York, N. Y. (John F. Kennedy)
23. New York (La Guardia)
24. New Orleans, La. (Moisant Field)
25. Oakland, Calif. (Metro. Oakland)
26. Philadelphia, Pa. (Philadelphia Int.)
27. Pittsburgh, Pa. (Greater Pittsburgh)
28. Portland, Ore. (Portland Int.)
29. San Francisco, Calif. (San Francisco Int.)
30. Seattle, Wash. (Seattle-Tacoma)
31. St. Louis, Mo. (Lambert-St. Louis)
32. Tampa, Fla. (Tampa Int.)
33. Washington, D. C. (Wash. National)

All airports located within the control zones of these hub airports are affected by the rule prohibiting specal VFR.

American businessmen are rapidly switching to turbine-powered aircraft. There were 915 turbine aircraft—pure jets and turboprops—in the general aviation fleet in 1967, up 341 from the previous year. According to FAA projections, that number will increase to 1,220 by the end of 1968, and to 3,850 by 1973. About 40 per cent of these aircraft will be pure jets.

By 1979, general aviation pilots will be flying an estimated 7,000 turbine-powered planes, while the air carrier fleet will consist of 3,300 pure jets and 400 turboprops.

What about the pilots who will fly these high performance planes—will any special physical qualifications be needed? In particular, does jet flight make heavier demands on visual ability?

FAA medical standards are similar for jet or non-jet pilots. Any pilot holding a Class III medical certificate, who is otherwise qualified, may fly jets.

The Air Force, interestingly enough, has not changed its visual requirements for cadets entering flight training in the past 25 years, the introduction of jets notwithstanding. Basically, these consist of "perfect vision"—20/20 uncorrected sight, full color perception, refractive error within specified limited range, normal depth perception and no significant eye diseases.

However, eye standards are not so rigid for older Air Force pilots. It is not rare to find Air Force pilots who wear corrective lenses flying the full range of military planes from the venerable C-47 *Gooney* to the supersonic Century-series fighters. Some Air Force pilots wear bifocal and trifocal glasses. Even quadrifocal glasses are available to aid in visual selection of the correct switch or knob arrayed on the overhead control console of some aircraft.

FAA recognizes that in the process of normal aging, near vision acuity tends to decline at about age 40. Standards for civilian pilots provide for the use of corrective lenses. Generally speaking, air carriers do not hire a *new* pilot with less than "perfect" vision, uncorrected, even though FAA may grant him a Class I certificate. However, if an airline or corporation pilot develops the need for correction in the course of his career, this reason alone, depending upon the degree of correction, does not bar his continued employment.

The airlines base their requirements for perfect vision in pilot candidates on dollars and sense. A man starting out with perfect vision is more likely to retain visual acuity for a longer period of time than one who already has had some correction made.

While FAA does not encourage the use of contact lenses, it does not prohibit their use. A "Statement and Demonstrated Ability" may be issued by the Regional Flight Surgeon upon receipt of a report from an eye specialist indicating that the lenses were properly fitted and tolerated.

Good eyesight—natural or corrected—is basic to safe flight whether the plane is a supersonic jet or a docile *Cub*. However, as speeds increase, the natural limitations of the eye to see beyond a certain distance, and the reaction time of both the pilot and the aircraft present problems that encourage research on airborne aircraft proximity warning devices. Positive control of all high performance aircraft has also been considered as a desirable safety measure.

In order to adequately "cover" himself as far as midair collision is concerned, a pilot must constantly move his eyes and head to scan the skies. He must look, not only directly ahead in the critical "11 to 1 o'clock" area where closing speeds are greatest, but above and below, and from left to right, since collisions can come from *any* angle. This applies to any kind of aircraft, piston-powered as well as jet-powered, because of the nature of the eye and its field of vision.

With the head at rest, the total field of vision is about 160°, but only *one per cent* of this area may be seen with top visual acuity. To perceive an aircraft at the maximum distance, the pilot must spot it in the *fovea,* a tiny dot in the center of the retina. Aircraft and other moving objects may be spotted in the remainder of the retina, but at a great reduction in sharpness. Hence, the need for the roving eye in the cockpit.

The distance an aircraft ahead can be seen is governed by a number of variables, assuming that the pilot has normal vision. Aircraft size and conspicuity are significant. Atmospheric conditions, including fog, dust, rain, hail or clouds, and time of day or night all play a part.

Since visual acuity is sharpest within one degree of where you are looking, it follows that in order to see "intruder" aircraft in time to avoid them, the head and eyes must constantly be searching the sky while also engaged in checking the instrument panel. This means actually moving the head and eyes up and down and horizontally. An immobile head means a limited field of vision—and possibly an unsafe pilot.

There is no substitute for this visual activity, but there are some techniques which help a pilot to see more efficiently. *See more of what you look at.* In speed reading, a student is taught to take in whole phrases, sentences and paragraphs at a glance, and retain most of what he looked at. The same technique can be used to check instruments, maps, radio frequencies, and attending to

JET PERCEPTION:

Over 1,000 "business jets" are active in today's general aviation fleet

other inside-cabin chores. This will allow more time for scanning the sky around the plane. (It also saves time and visual effort if you are completely familiar with your instrument panel and cockpit arrangement.)

It takes a measurable amount of time for the eyes to focus on an instrument panel after they have been "set" on a distant object. Once attuned to the environment of the cockpit, they must refocus for distance when the gaze is once more directed outward. This visual lag can be a serious impediment to constant surveillance. The lag is increased by fatigue, hypoxia and aging.

The presence of a second pair of eyes in the cockpit of a fast-moving aircraft is a decided safety advantage.

In high altitudes, sun glare reflected from the clouds below presents a comparatively new hazard to the general aviation pilot. Glare reflected from the cloud roof below can produce some haziness of vision, unless the pilot is protected by proper sunglasses.

Sunlight glinting on shiny metal parts of the aircraft can be fatiguing on the eye, and in extreme cases might be compared to being "caught" by a suddenly discharging photo flash bulb. Surfaces likely to be in the line of vision, such as the upper portion of the forward fuselage and the inner surfaces of engine nacelles, if they fall within visual range of the air crew, should be painted a dark, light-absorbing color. High altitude sunlight, unfiltered by clouds, is potentially damaging to the unprotected eye.

Neutral gray, Air Force type sunglasses are available commercially. These are superior to tinted lenses because they do not distort colors.

While operating VFR with visibility reduced by haze, the approach for landing of a jet aircraft, without the aid of instrument approach facilities, makes heavier demands upon the pilot than is the case with slower piston aircraft under similar reduced visibility circumstances. For example, slow piston aircraft may be flying at 80 knots, while an executive jet may be proceeding at 200 knots.

It helps a pilot to know as much as possible about an airport before flying into it. This information is available in the *Airman's Information Manual*, approach charts, NOTAMS, from flight service station and air traffic personnel, and from pilots who have flown into the airport.

In the 64 years man has been flying powered aircraft, he has increased his speed through the air from 28 mph to 4,000 mph, and beyond (in the X-15). Man has managed to enter a Mach 3 world with the same physical equipment he had when he made his first stone tools. There is reason to believe that large numbers of non-supermen, average pilots with normal reflexes and a Class III medical, can transition smoothly into the growing world of general aviation jets, given appropriate training and the proper attitudes.

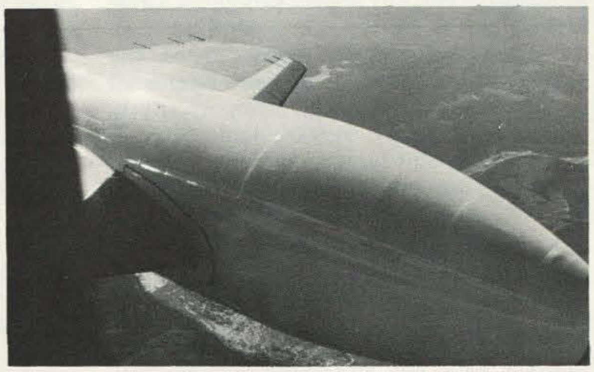
SPEED RANGE OF GENERAL AVIATION JET AND PISTON AIRCRAFT (MPH)

JET	Cruise	Hi-Speed	Stall	Landing
Aero Jet Commander	503	525	101	131.3
Lear Jet 25	508	565	104	135.2
Grumman Gulfstream II	585	585	117	152.1
Lockheed JetStar	500	574	110	143.0
North American Sabreliner	504	560	92	119.6
PISTON				
Beech Baron C35	230	242	77	110.1
Aero Commander 500 U	218	233	68	88.4
Cessna 401	240	261	79	102.7
Cessna Executive Skyknight	260	275	72	93.6

Visual Adaptation to General Aviation Turbine Aircraft

by Stanley Mohler, M.D., and S. J. Gerathewohl, Ph.D.,
FAA Office of Aviation Medicine

Below, left—During low level flight in a jet aircraft the terrain may appear blurred unless pilot is trained to look ahead. Right—At the higher altitudes in the jet cruising range, earth below appears to move past slowly.



Higher landing speed is noticeable.

With its wings folded back, the American SST will achieve speeds up to 1800 mph.

In supersonic flight safety begins with The SKIN

When the U. S. supersonic transport reaches cruise altitude between 65,000 and 70,000 feet, and the pilot has tucked back its 174-foot wing to its high-speed span of 106 feet, the 675,000-pound aircraft will be knifing through the air at more than twice the speed of sound—1,800 mph, or Mach 2.7.

Temperatures along the leading edges of the wings and tail surfaces will exceed 450° F, and the fuselage skin temperature will register a searing 400 degrees.

Inside, some 300 passengers and crew will be unaware of the hostile environment surrounding the plane. The cabin temperature will be a comfortable 75° F and the cabin altitude will be maintained at 6,000 feet. The crew, and the more technically oriented passengers, will have another measure of comfort—they will know that their aircraft will maintain all of its designed strength characteristics, despite the high temperatures bathing the plane's structure.

The U. S. SST will be able to fly at 2.7 times the speed of sound with skin temperatures of 400° to 450° F because it will be constructed almost entirely of titanium alloy. The skin of the craft will be an alloy containing 90 per cent titanium, six per cent aluminum and four per cent vanadium.

Strength to Weight Ratio

The high-strength-to-weight ratio of titanium makes it a particularly attractive metal for aircraft designers. On the average, it is 57 per cent lighter than steel of the same strength. Moreover, it retains its strength in long-time application in high-heat conditions. Titanium is regarded as slightly more difficult to work with than aluminum, but not as troublesome as stainless steel.

Titanium is easily cut by power hacksaw, like aluminum, but it is too tough for a hand saw. Titanium can be sculptured on the same type of milling machines now used for aluminum and steel, with relatively minor modifications. For titanium, the milling machine must be rigid and rugged, with a special cutting head, and a different feed rate and machine speed.

Except that the temperatures are higher —1,200 to 1,400° F—titanium is bent into shape by the same kinds of devices used to shape other metals. This is an inherent advantage because the higher temperatures produce stress-free and more accurate configuration of each part. This reduces the amount of straightening and other hand work in assembly.

The skin of the British/French joint-venture supersonic transport, the *Concorde*, and the Russian supersonic TU-144, is aluminum, a metal which loses much of its strength at temperatures exceeding 250° F. Because of this, the top speed of the *Concorde* will be about 1,450 mph, and the TU-144 will have a speed of 1,500. Unless the structural material is changed, increases in the speed of the *Concorde* and the TU-144 are unlikely, while industry reports that the U. S. SST speed might ultimately be raised to 2,000 mph.

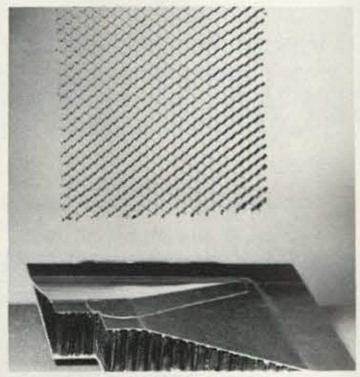
If the leading edge of the wing of the U. S. SST were cut, the gash would reveal a "sandwich" with titanium on both sides of a fiberglass honeycomb polyimide filler. This construction provides for lightness without sacrifice of stiffness. The honeycomb sandwich is also used in other low-stress areas—the wing strakes, trailing edges, flaps, spoilers and control surfaces.

Except for certain fittings and parts designed for highly concentrated loads, such as the landing gear, titanium alloys will be used for almost all of the airframe. This includes bulkheads, formers, ribs, frames, stringers and the entire skin surface.

A Common Element

While titanium is spoken of as one of the new glamour metals, it is actually the fourth most common structural element in the earth's crust. Titanium ore, called *rutile*, is a lustrous, dark-red mineral (titanium dioxide, TiO_2), commonly found in prismatic crystals and usually containing some iron. It is found on ocean beaches in many parts of the world and mining it is simply a matter of scooping it up. Refining it into titanium, however, is not so simple.

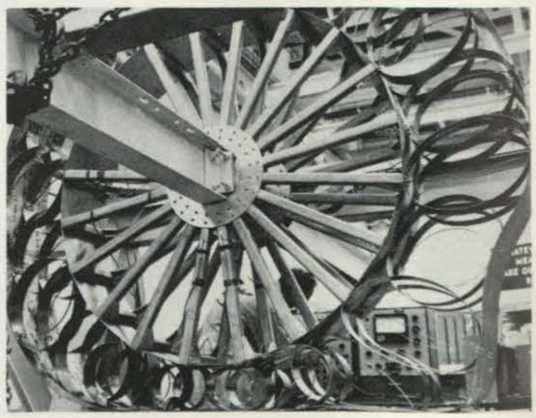
Part of the mystery surrounding titanium is due to the fact that it made its commercial debut in 1948, practically yesterday, compared with other metals. The discovery of titanium, however, was made in 1789 by the Rev. William Gregor, a British clergyman who was also a practicing chemist and analytical mineralogist. Coming upon



Above, left—Extremely ductile, titanium is a very versatile aircraft metal.

Above—Titanium honeycomb combines strength and lightness.

Below—The springy quality of sheet titanium gives it many aerospace uses, as these lunar vehicle wheels demonstrate.



Even in the rarefied atmosphere 12 miles high, air resistance will create 400° plus temperatures on the surface of the SST. To prevent metal failure, special titanium alloys replace conventional aluminum sheathing on the U.S. aircraft.

of the SST

a strange black sand found along the beaches of Cornwall, he noticed that it had properties of unusual toughness. In a spirit of poetic whimsey he named the element for the Titans of Greek mythology who were noted for their strength and power.

Because of the complex series of steps needed to convert titanium ore into a usable metal, it remained little more than a curiosity until the missile age and the advent of high-performance aircraft created a demand for a metal that was stronger and lighter than steel and had a higher strength-to-weight ratio than aluminum at elevated temperatures.

Titanium is that metal. It weighs one-sixth of a pound per cubic inch, compared to one tenth of a pound per cubic inch for aluminum, but it is stronger than aluminum and has a higher resistance to heat.

At room temperature, the strength/weight ratio of aluminum to titanium is 1.0 to 1.3. At 265° F, the temperature generated by Mach 2.2 flight (approximately 1,500 mph), the ratio changes to 0.8 to 1.2. At Mach 2.7 (approximately 1,800 mph) the temperature rises to 450° F, and the strength/weight ratio becomes 0.5 for aluminum to 1.05 for titanium. Titanium is more than twice as strong.

With titanium, it is possible to build an aircraft structure suitable for the 450° operating environment that has been a chief stumbling block for supersonic aircraft designers.

To change rutile into titanium, the metal industry uses a process developed by the U. S. Bureau of Mines. It is more of a chemical procedure than smelting in the usual sense. A major hurdle hampering earlier refinement was the fact that molten titanium has a strong affinity for oxygen. Even traces of oxygen cause titanium to become brittle and practically useless, on hardening. To shield the metal from this contamination, a chemical-metallurgical process is used in which the molten metal is blanketed by inert gases, argon or helium, in airtight reaction vessels.

Reduction of Ore

Reduction of rutile to titanium is work for a sophisticated industrial nation. In its transformation from sand to a dull silvery metal, the ore is first placed into a chlorinator where it reacts with chlorine gas at high temperatures to yield titanium tetrachloride, a colorless liquid. This is combined with molten magnesium metal in a sealed steel reactor under a controlled atmosphere where it yields titanium metal in a sponge form—plus magnesium chloride.

Growing demand has upped production and reduced the price of titanium. In 1948 only three tons of the metal were produced. In 1966, production reached 12,500 tons, and the forecast for 1970-1975 is for between 25,000 and 30,000 tons. A good part of this will go into aircraft.

Raw titanium sponge cost $5 a pound in 1954. The price fell to $3 in 1957, and to $1.50 in 1960. The current price for sponge is from 99 cents to $1.33 a pound.

The sponge is further processed into titanium ingots, and from ingots into mill products—billets, sheets, plate, wire and extrusions. This is the metal the aircraft manufacturer works with. About 420,000 pounds of mill products will go into the U. S. supersonic airliner, but after machining, cutting, shaping etc., the final weight of the titanium remaining will be about 140,000 pounds.

The dry, empty weight of the completed airplane will be 288,100 pounds. With fuel, 292 passengers, crew of three, plus eight stewardesses, the gross takeoff weight of the prototype will be 675,000 pounds.

The SST wing area alone will be sheathed with about 18,000 square feet of titanium, fastened to the structure by titanium rivets with about twice the strength of aluminum rivets. Most of these will be ⅜ of an inch in diameter, or smaller, and will be squeezed into position rather than "driven." So tight will the fit be, that *lubrication of the rivets* will be normal installation procedure.

In addition, about 200,000 titanium taper-lock bolts will be used in various parts of the U. S. SST. Some titanium components will be spot welded, and others will be joined to the aircraft by some form of diffusion bonding.

Other Uses

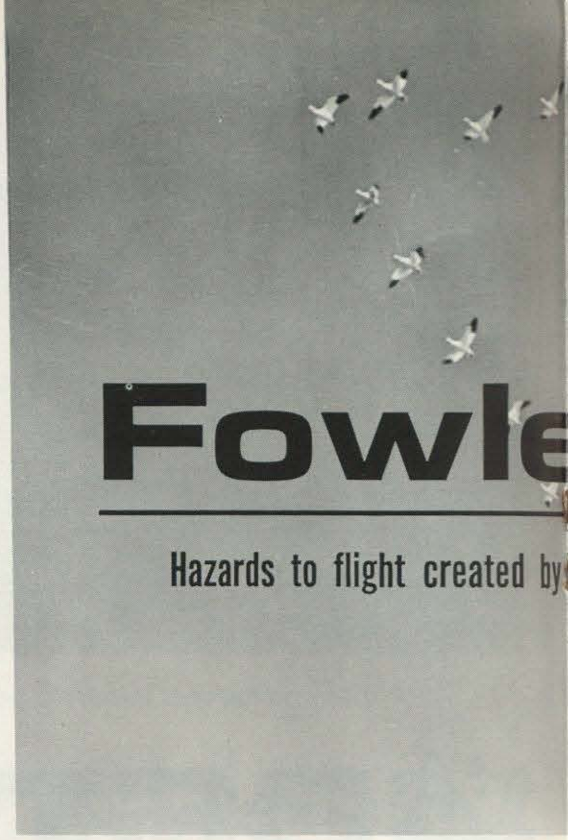
Actually, the U. S. SST is a late-comer among aircraft to use titanium. It has long been used in compressor wheels and other parts in jet engines where it functions well under conditions of elevated temperatures and high centrifugal forces. Titanium is widely used in a variety of aircraft as firewall material because it can stand up to 1,000° F. Elsewhere on the airframe, it is used for engine nacelles and pylons where high strength, vibration and fatigue resistance, along with light weight, are major considerations.

The adoption of titanium as the basic sheathing material for high-speed aircraft may prove to be as vital a turning point in the history of aircraft development as was the shift from fabric to aluminum, over half a century ago. In the first stage of aircraft design, lightness of material was the all-important factor, and fabric served this need best. As the speed of aircraft increased, strength of sheathing became important, and the search for a suitable metal led to the universal selection of aluminum.

In the early twenties, aluminum was expensive, scarce, and associated with a whole new world of fabrication problems for aircraft builders who were used to the convenience and simplicity of fabric. Those who refused to move with the times fell by the wayside. Today the aluminum-sheathed aircraft has apparently reached the limits of its development, as regards speed of flight, and designers with an eye to the future are looking for a new metal alloy to plumb the depths of space and outrace the sun.

Titanium may be the answer.

—Frank J. Clifford



Fowle

Hazards to flight created by

"Radome penetrated—16-inch by 20-inch hole. Right nose gear door dented and wrinkled 24 inches aft from leading edge. Hole 12 inches by six inches on leading edge 12 inches inboard No. 3 engine. No. 2, 6 and 18 cylinders received direct hit . . ."

Flak? No, damage caused by a flock of 16 geese encountered at 9,500 feet by an airliner as it descended through clouds. The estimated damage was in excess of $20,000.

Airliners are not the only victims. A $1,500 repair bill for a damaged wing was presented to a pilot after his light plane struck a gull at 6,500 feet while cruising at 166 knots. The weather was clear and the pilot attempted evasive action, but there was not enough time.

These two incidents were taken at random from a file of 601 bird strikes reported to the FAA in Calendar 1966. During this period, five persons died in two aircraft-bird collisions, and one person was injured in another. The air carriers currently pay out over $10 million a year for bird damage. General aviation's repair bill exceeds $100,000 per year, with individual losses ranging from a few hundred dollars to $50,000.

The highest single accident toll in recent years occurred in October, 1960 in Boston, when starlings caused engine failure in an *Electra,* which crashed on take-off, killing 62 persons. Ironically, the first American astronaut fatality, Captain Theodore Freeman, died after his jet collided with a snow goose near Houston, in 1964.

Few G.A. Incidents

An analysis of the 601 bird strike incidents in 1966 disclosed that approximately 66 involved general aviation planes. Airliners reported 480 strikes, military aircraft reported 36 incidents and FAA crews operating agency planes, 18.

This relatively small involvement of general aviation aircraft may be more apparent than real. Pilots are not required to report bird strikes or near miss incidents although they are encouraged to do so. ("Bird Strike/Incident Report," FAA Form 3830—a self-addressed, postage-paid report form—is available at any FAA Area Office, General Aviation District Office, Flight Service Station, and Air Carrier District Office.)

Judging from statistics, the chances of an aircraft being struck by a bird in flight in the continental United States are extremely small. Yet the possibility does exist, and since it is neither practicable nor desirable to rid the skies of birds, it behooves the airman to become alert to the areas, altitudes and periods of peak bird flight activity, and to look out for himself and his airplane.

The most serious accidents have occurred to turbine-powered aircraft on take-off. Small birds may be sucked into the air intake of jet or prop jet engines and cause a flame-out at critical airspeed. Research is being conducted by both FAA and the Air Force on grills which would prevent birds from being ingested. However, the problem is a complex one and still far from being solved. Screens fine enough to keep out small birds tend to ice up under unfavorable atmospheric conditions, effectively shutting down the engine. There is no such thing as a bird-proof airplane.

As aircraft increase in number, size, speed and range, so does the possibility of in-flight encounter with "native" inhabitants of the sky. At the rapid closure rates common to jets and other high speed aircraft, birds become more difficult to see. Therefore, both the birds and aircraft have less time to take evasive action. This is particularly true of the larger, slower moving birds, such as gulls, geese and ducks.

Gull Force

Assuming that an aircraft's skin is unyielding, a two-pound bird, such as a sea gull, crashing into a light plane flying at 200 mph, could have a force of 8,000 pounds. If the aircraft is a 600 mph jet, the impact force would be 72,000 pounds.

If the encounter is with a four-pound bird—an eider duck, for example—the light plane would receive a 12,000 pound blow, while the jet would receive an impact equivalent to 108,000 pounds. Wild geese or swans can weigh over 14 pounds, so the potential destructive value is evident.

These are maximum theoretical values, under "ideal" conditions, where impact is with a whole bird striking head on; the actual force in a real encounter would be less, depending on the angle and point of impact. The figures are cited only to illustrate the destructive potential of even a small bird striking a fast-moving airplane. Because birds appear to be mainly made up of feathers, it is easy to assume that they are harmless to aircraft, but this is not true.

Left—Bloody and bent is the horizontal stabilizer c aircraft struck a bird in flight. Right—Mangled eng resulting from impact of airborne geese against this

ed Air

resident or migrating birds

The bird strike problem is most acute in two areas: the environs of airports, and the flight paths of migratory birds which travel long distances between their winter and summer breeding grounds. Apart from sea gulls, which account for about 40 per cent of reported bird strikes, ducks and geese are the most serious offenders.

The time to be especially alert for migratory waterfowl is from March 1 through April 10 and from mid-October through November, according to recent studies by the Department of Interior. During these periods, hundreds of thousands of birds throng the four major bird flyways, which extend from Canada through the U. S. to the Gulf of Mexico and beyond into Latin America.

During the winter months, birds using the Atlantic flyway, which hugs the Eastern seaboard, concentrate around the Chesapeake Bay area in Virginia, and the Currituck Sound and Lake Mattamuskeet area in North Carolina.

The Mississippi flyway wintering grounds are in the Mississippi Valley and the South Louisiana marshes along the Gulf of Mexico. Wintering grounds for the Central flyway are along the Missouri River and the Gulf Coast of Texas. For the Pacific flyway, they are in the general area of Lake Tahoe and the Sacramento Valley area of California.

An indication of the numbers involved, and the air space preempted, is seen in the migration of the various members of the geese family, with their characteristic of moving in flights of up to 25,000. Some 500,000 Canada geese make the annual two-way flight between Hudson Bay and James Bay in Canada, enroute to the Mississippi flyway. Some 100,000 of these pass about 25 miles west of Milwaukee's Municipal and 50 miles west of Chicago's O'Hare Airport. Approximately 500,000 snow and blue geese wing their way down the Mississippi flyway on a broad front, with considerable numbers of them passing over most of the airports in the valley.

On their return north in March, the birds follow a slightly different course, moving up the Missouri River and across southwest Iowa. Their passage creates a hazard around airports near Kansas City, Omah, Sioux City and Sioux Falls.

Millions of Ducks

What ducks lack in weight, compared with their heavier cousins, they make up for in numbers. Every year between 7,000,-00 and 15,000,000 mallard and pintail ducks stream through the Mississippi flyway; another 3,000,000 overfly the Central Valley in California, and some 2,000,000 to 3,000,000 migrate through the Atlantic Coastal states. Both species migrate on broad fronts, covering most of the western states, with the heaviest concentrations occurring in the Mississippi and Missouri Valleys. They also appear in considerable numbers along the West and Atlantic Coasts and the St. Lawrence River.

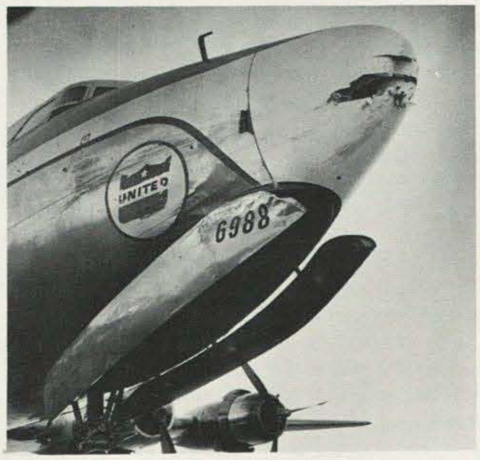
Fortunately for aviation, most birds migrate at night, when air traffic is at its lowest activity. An estimated 80 per cent of ducks and 60 to 70 per cent of geese fly at night during their fall migration; in the spring, nocturnal migration is estimated to include 65 per cent of the ducks and 50 per cent of the Canadian geese.

Around airports, bird hazards are increased by the presence of either man-made or natural watering or feeding areas. Birds of passage, as well as resident flocks of local birds, are attracted to ponds, marshes, garbage dumps, food processing plants, seed and fruit-producing plants and trees, tall grasses, reeds and shrubs. Resident birds have congregated around airports in such numbers that local airport authorities have had to close down runways temporarily. The assumption that birds will instinctively avoid moving aircraft is not always true, especially with regard to jets.

Most of the bird strikes reported to FAA occur at an altitude of less than 3,000 feet, with a heavy cluster reported under 100 feet above ground. Nearly half of the incidents occur at airports. In one controlled study of 148 bird strikes (FAA AC 150/5000-1), damage occurred in 136 cases with the following distribution: 24 per cent on take off, 10 per cent on approach, 1 per cent on paved surface, 37 per cent at 800 feet or less and 28 per cent between 800 and 2500 feet.

FAA's role in the prevention of bird damage to aircraft lies primarily in disseminating information and conducting research on feasible safeguards. The scope of these programs, and the role of airmen in protecting their aircraft from bird hazards will be discussed in a subsequent article. ■

f the Air Force T-37 jet trainer after the 400 mph
ine cowl and perforated wing testify to the force
United DC-6, at 9,500 feet over Saginaw, Michigan.

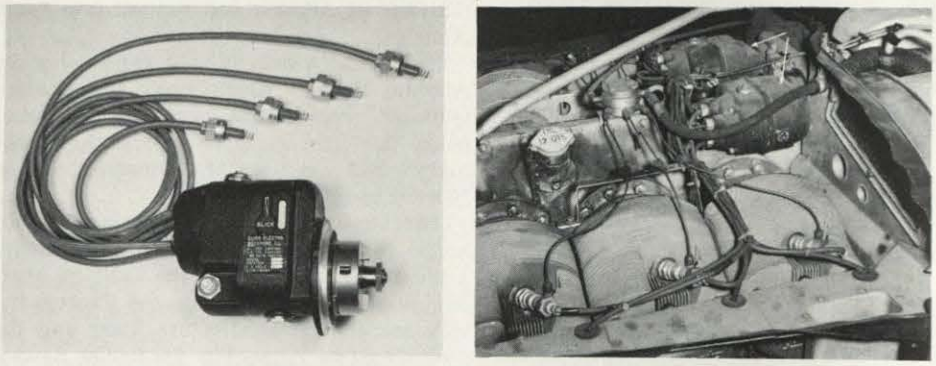


Left—Flooded areas like this levee in Arkansas draw waterfowl by the thousands. These are mallard ducks. Above—Even the streamlined radome can be penetrated by a direct hit from feathered flak.

What's Up Front

Third in a series on aircraft engine components, how they work and how to prevent their failure—

MAGNETOS



Above, left—A typical light plane engine magneto. FAA requires two magnetos on all aircraft reciprocating engines. Right—Twin magnetos mounted on engine rear.

Left magneto . . . right magneto . . . the rpm drop is within the permissible range and off you go. Rev-up time is just about the only time when we give any thought to the curious instrument with the ancient history called the magneto, and yet this device is the sole source of the vital spark which keeps the piston engine turning over smoothly and continuously in flight. What exactly is a magneto? And why do aircraft engines have them when automobiles do not?

Internal combustion engines use an electrical spark to ignite the explosive mixture in the cylinder. In 4-cycle engines ignition takes place once every two revolutions of the crankshaft. This means that when the propeller is turning over at the rate of 2,600 rpm, a high voltage electrical charge must be delivered to the spark plugs at a rate of 1,300 times per minute.

The instrument that delivers this charge is no larger than a grapefruit and weighs only a few pounds. Its cost, for most light aircraft, is under a hundred dollars and it will usually last the lifetime of an aircraft. It was present in the first aircraft that ever flew, and from that day to the present has contributed importantly to the safety of all who fly.

The magneto is a special type of generator whose sole function is to provide power for the ignition system. All other electrical needs of the aircraft are supplied by a battery which is supported by its own generator. In the early days of flight when weight was an overriding consideration, the light weight of magnetos compared with batteries was a tremendous advantage.

For example, the engine in the Wright Brothers successful aircraft weighed approximately 200 pounds, even with its advanced aluminum block, while delivering an initial *12 horsepower*. (After a few minutes of flight this fell to 8 horsepower.) The average ratio of weight to horsepower was 20 to 1. By way of comparison, a typical modern light plane engine weighs 275 pounds and produces 150 horsepower—a weight to horsepower ratio of 1 to 1.83. To save weight, the Wright engine was started by a ground battery and coil which was then disconnected; in flight, ignition was maintained by a magneto.

Dual Ignition A Must

Modern aircraft have no difficulty in carrying a battery for general electrical purposes, but the aircraft engine still differs from the automobile engine in that it employs a magneto for ignition power instead of relying on the batteries for this purpose.

In fact, dual magneto systems are required for all modern aircraft (including antique aircraft) because of the superior reliability of this type of ignition system. Two spark plugs, rather than one, are located in each aircraft engine cylinder. Each is supplied power by a separate magneto. The spark plugs in each cylinder fire simultaneously—or in some circumstances they may be arranged to fire in sequence. Dual ignition produces a more complete or efficient combustion than single ignition, and it also offers a fail-safe principle. If a failure occurs in any part of one ignition system, the aircraft can operate with only a slight loss of power on the other system alone. The success of the magneto is based on certain properties of magnetism which have been known as far back as 3,000 B.C., when Greek scientists made some interesting observations about the lodestone or magnetic ore. It was not until the 19th century, however, that physicists learned how magnetism could be used to induce electrical current in a winding. The discovery that when a magnet was rotated in the presence of a wire coil, electrical current would flow back and forth through the coil, led directly to the invention of the magneto.

The magneto consists basically of a permanent magnet rotating in the presence of a wire coil wound on a soft iron core. The magnet is currently made of some alloy, such as alnico, a combination of aluminum nickel and iron. As the magnet rotates, its lines of forces are continually disturbed by the change in position, and this disturbance causes an electrical current to flow in the coil. A secondary coil wound on the same core serves to step up the electricity from a few volts to as much as 24,000, supplying the high voltage required for a good spark.

Thus the magneto is both a generator and a transformer of electricity. The stepped-up charge is distributed individually to the spark plugs by a wire harness connected to a distribution cap. The distributing mechanism as well as the rotating magnet are driven by the crankshaft at a cost to the engine of a negligible five rpm.

Until the high-tension magneto system became the system of choice among designers, some aircraft in the '20s and late '30s employed a battery ignition system. At least one engine, made by the Jacobs Company, used a combination battery and magneto system in a "fail safe" arrangement. One system would fire the front row of plugs, and the other would fire the rear row. The combination was used in the Cessna 190 and 195, circa 1948, and in the WW II twin-engine trainer, the Cessna "Bamboo Bomber," an all-wood aircraft.

Battery or magneto, both systems have the same fundamentals: source of electricity, a transformer, an electrical condensor, (for containing the charge) a distribution system to deliver the current to the spark plugs, control switches and the necessary wiring.

Without the assist of an electrical or mechanical boost, a magneto cannot develop enough of a wallop to start an engine.

At starting speeds, the rotating magnet, geared as it is to the engine, does not spin fast enough to produce the current necessary to fire the spark plugs. This is true of electrically started engines as well as those that must be hand propped. The point at which the magnetos can go it alone is called the "coming-in" speed, which varies with engine type, but averages about 100 rpm. A little outside help is needed and this is supplied by *ignition boosters*. A high-tension coil (powered by the battery) or a vibrator which may be used to send an initial starting charge to the magneto.

Impulse Coupling

Another source of high energy for starting the engine is an impulse coupling, installed directly on the drive shaft of the magneto. When the engine is started, a spring inside the coupling is tightened by the rotating engine drive for a substantial portion of one crankshaft revolution. At the point where the engine and magneto design requires the magneto to deliver its fire, the spring is released, spinning the rotating magnet rapidly and sending a strong spark to the plug. After the engine fires, centrifugal force keeps the impulse coupling disconnected. An engine so equipped can be started without a battery assist, at lower temperature.

The advantages of magneto ignition systems over batteries became apparent when aircraft began to incorporate numerous electrical circuits. To supply both aircraft and ignition electrical demands, bigger batteries and generators were needed and the end was clearly in sight. In operation, the generator would supply "replacement" electricity to the battery, but in practical application demand sometimes exceeded supply, and electrical power was not always available in effective amounts. More calamitous, if the battery failed, ignition ceased instantly, to say nothing of the rest of the electrical system.

Magneto preflight check is a simple procedure of revving up the engine and moving the ignition switch to cut out one mag, leaving the load to be carried by the remaining one. A reduction in rpm results, caused by less efficient (single spark) combustion. Ideally, the rpm drop is slight, amounting to about 25 rpm, but this is rarely achieved. The maximum permissible drop for a particular aircraft engine is specified in the operator's handbook. *Under no circumstances should flight be attempted if the drop exceeds manufacturer's specifications.*

When checking the magnetos on an engine equipped with a constant speed propeller, the prop control must not be set in the constant speed range. If the ignition is defective, as indicated by an excessive rpm drop, the propeller governor will attempt to make up for the decrease, thus masking a potentially hazardous condition.

A drop in rpm on checking the magnetos frequently can be traced to a temporary fouling of the spark plugs caused by condensation across the plug electrodes. Similarly, plugs, wet with unburned fuel or fuel-borne water, give inefficient firing, resulting in rpm drop. Running the engine up at high speed for a few moments, and then rechecking each magneto, frequently brings the rpm drop back within tolerance.

FAA regulations restrict magneto maintenance to certificated engine mechanics, approved repair stations and the manufacturer. Aside from a visual check (including grasping the magneto to determine security of mounting,) and inspection of the leads from the magneto to the spark plugs, there is nothing a pilot is permitted to do in the line of magneto maintenance.

Magnetos Long-lived

He has little need to. So dependable have they become, magnetos are only torn down for inspection at engine overhaul. Periodic inspection procedures are prescribed by engine manufacturers. Magnetos installed as long ago as 1929 are still giving good service, and magnetos of WW II vintage are commonplace. It is an article of faith among magneto manufacturers that a magneto is good for the life of the engine—and beyond. When maintenance is required, it is usually minor—replacing of distributor points or the condensor.

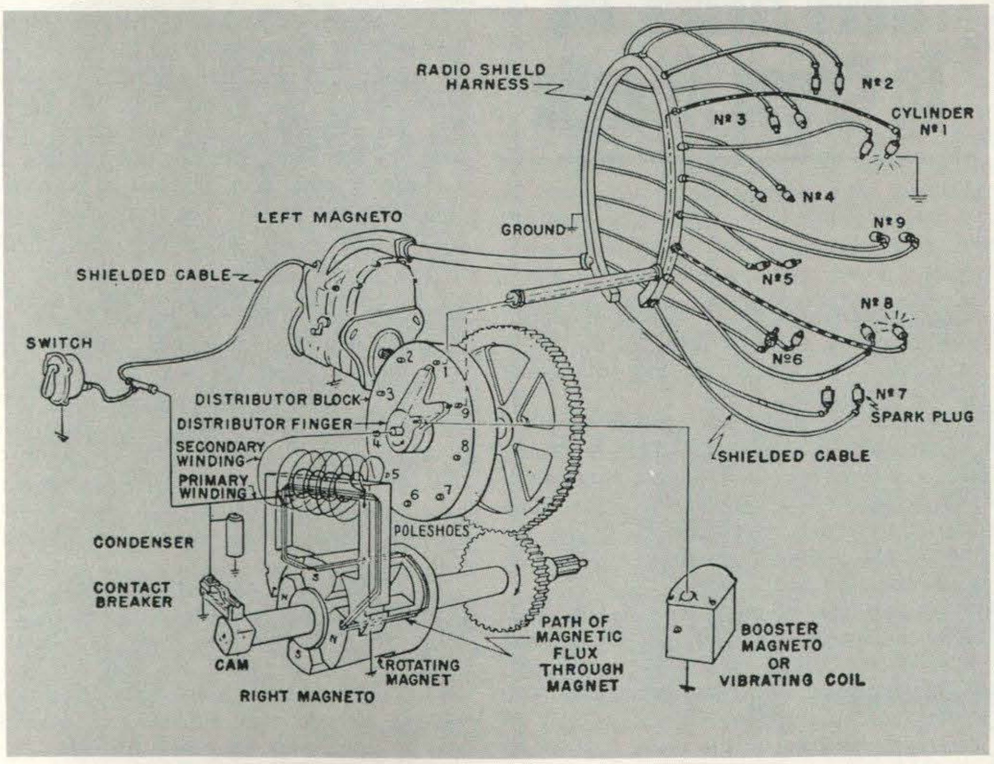
Magneto failure is rarely abrupt. It is something that "accumulates" and makes its presence known by intermittent rough engine performance. This may occur is flight, even after the preflight magneto check gave no cause for alarm. The symptoms can be confused with water in the fuel or spark plug malfunction. When the flight is terminated, the symptoms sometimes disappear spontaneously, only to recur in flight. An immediate inspection by a mechanic is indicated.

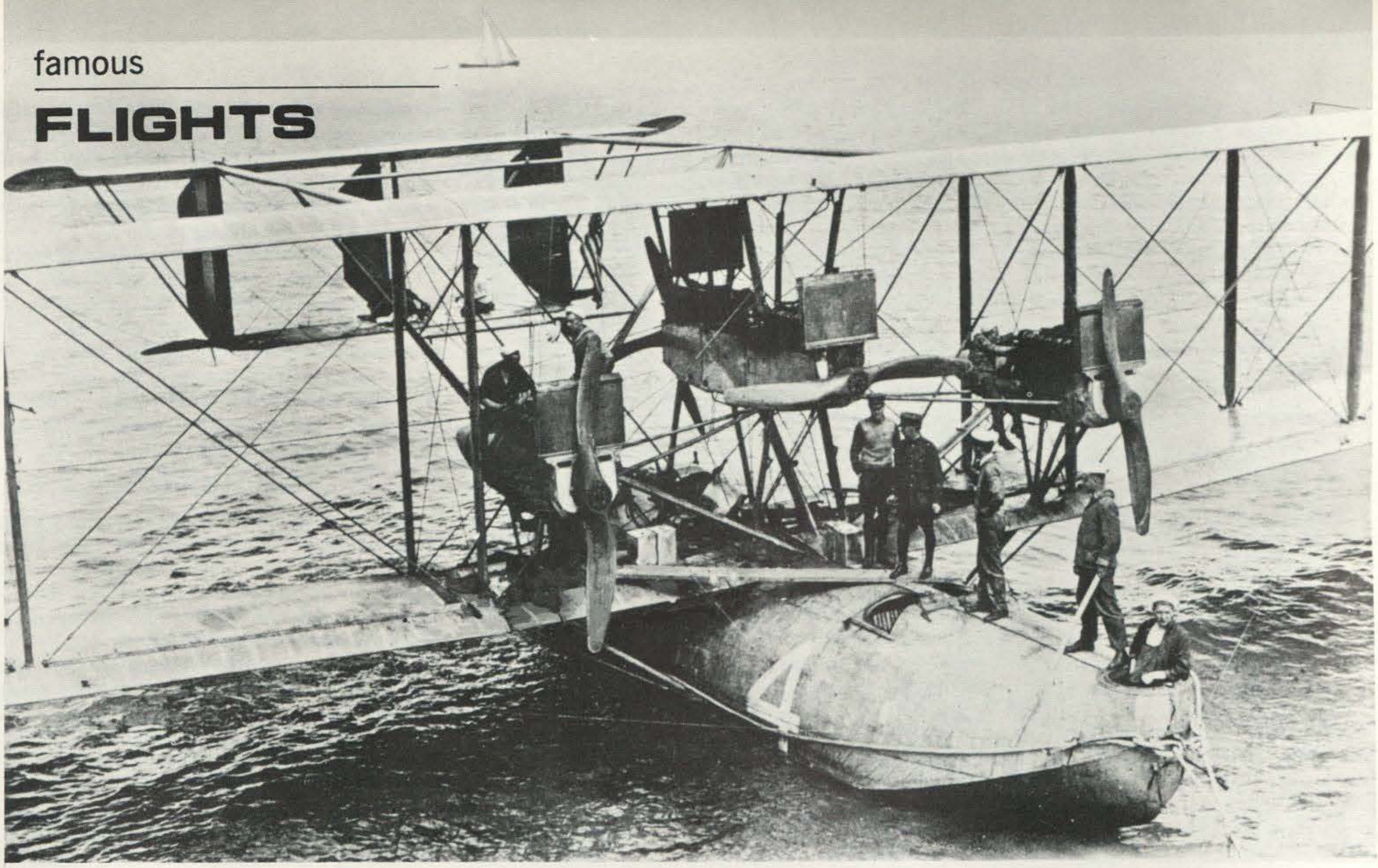
While the dependability of magneto ignition has been demonstrated amply by the fact that it is the only type now in use in aircraft reciprocating engines, manufacturers continually strive for improvement.

Over the years, weight has been brought down from about 25 pounds per magneto in the late '20s to the present eight pounds or less. One prominent manufacturer of light plane ignition systems markets an "exchangeable" magneto which weighs less than four pounds and cost $65 new. The manufacturer will "buy" it back from the customer, with a variable allowance based on the number of hours of use on a replacement. The allowance for time beyond 800 hours, for example, is $40—a substantial down-payment of a new magneto.

Exactly when and by whom the magneto was invented is not known but low-tension magnetos were in use in 1890, more than a decade before powered flight began. Although jet aircraft have managed to do away with sparked ignition, the vast majority of aircraft engines will continue to depend on the magneto in the foreseeable future. The magical lodestone of ancient times has not lost its touch.

Dual magneto ignition system. Exploded view in foreground shows internal mechanism of right magneto. Left magneto as it appears in its case on the engine.





Seven Years Before Lindbergh, First Atlantic Flight Was Made In A Curtiss Tri-Motor Flying Boat

Hop-Skip-Jump: Navy Flyers 1st To Cross Atlantic

It was to be a Navy spectacular. An airplane would cross the Atlantic Ocean. No one had made the flight before and now the Navy planned to do it with *four* Curtiss seaplanes. To top it off, Navy officials also secretly arranged to have a blimp on hand. It, too, would make the overseas flight. That it would be a real happening none could doubt. It was 1919—less than 10 years after the airplane had made its first long distance flight. That record breaking flight began in Albany, N.Y., and ended 156 miles away in New York City.

Of the five flying machines originally scheduled to make the trans-Atlantic flight, only one would arrive in London.

Disaster struck right at the beginning. One of the four Curtiss flying boats especially built for the trip plunged into the Atlantic Ocean during a training flight and was destroyed. A few days later, the boatshed housing the other three planes caught fire. The aircraft were saved only by the heroism of their crews. Later, a propeller accident severed the arm of an engineer and destroyed an engine.

The flight officially began on May 8th, 1919 when three aircraft—NC-1, NC-3 and NC-4 (NC for Navy Curtiss) took off from the Naval Air Station at Rockaway, Long Island, bound for Halifax, Nova Scotia. During the flight the flying boats lost contact with each other but that evening NC-1 and NC-3 completed the 540 mile journey almost simultaneously. NC-4 had developed engine trouble and put down in the water off Cape Cod, later proceeding to a Navy station at Chatham, Mass.

Because the flight was already overdue, the two planes at Halifax left immediately on the second leg—to Trepassy, Newfoundland—without waiting for NC-4 to catch up. At Trepassy, preparations began for the actual Atlantic crossing—1,300 wet miles non-stop to the Azores.

But five days of continuous bad weather delayed departure, and excitement on both sides of the ocean turned to restlessness. Public impatience was understandable. The Navy had assigned five battleships and 60 destroyers to assist in the flight. Twenty of the destroyers were stretched in a line across the Atlantic to serve as beacons and as rescue ships, should any of the planes go down. The fleet had been at sea several weeks already and supplies were running low.

The tedium of waiting in Newfoundland was relieved momentarily by the arrival of the blimp C-5 and the official announcement that it, too, would make the flight. But the excitement was momentary. The next day the blimp, pitching and twisting in a North Atlantic gale, snapped its tie-ropes and blew out to sea. The three-man crew hopped out at the last minute; the blimp was never seen again.

On Thursday afternoon, May 15, the weather began to lift and the heavy seas of Trepassy Bay began to recede. The decision was made to leave the next day—without the NC-4. Almost simultaneous with that decision—and as it might have happened in a grade B war movie, the NC-4 hove into sight on the horizon. Nothing was going to keep its captain—Lt. Commander Cushing Read—from making the historic trip.

On Friday the dawn broke clear and bright, but it was late afternoon before the Navy aerial flotilla was ready to depart. The three planes taxied out into the bay, revved up their engines and took off. After gaining altitude they turned and headed east by south over the broad Atlantic.

The Navy's trans-Atlantic planes were four-engine, two-winged flying boats. They had a wing span of 126 feet and an overall length of 68 feet, 4 inches. Their average cruising speed was 79 knots and they flew at altitudes between 2500 and 3000 feet. Each flying boat carried a crew of six.

For the first few hours of the ocean flight, everything went well. All three aircraft reported to each destroyer on the line almost on schedule. By mid-morning the next day, however, the pattern broke. One destroyer, almost two-thirds across the Atlantic, reported it had been able to contact only two aircraft. An hour later, another destroyer—further along—reported contact with only *one* plane. By mid-afternoon all radio contact between the planes and the fleet below had ceased completely. In the wardrooms of the fleet and in the Navy offices in Washington, men began to worry and wonder.

The suspense let up a few hours later. One aircraft had put down in the Azores safely, and without incident, and the men were ashore. It was the hard luck NC-4. A few hours later a wireless from the steamship *Iona* brought more good news. It had picked up the NC-1 at sea. Its crew was on board the ship and the plane was in tow. (Shortly after, however, a wave snapped the tow line and the plane capsized and sank.) But of the NC-3, there was no word or clue. Uncertainty became anxiety, and as the hours slowly passed, anxiety became fear.

Had the facts been known, the fear would have been greater. Late in the afternoon of the trans-Atlantic flight NC-3, separated from the other two planes, had experienced radio failure. Its doughty C.O., Lt. Commander Towers (Admiral "Jack" Towers of World War II fame), finding himself in fog with only two hours of fuel, decided to set the plane down so that he might determine his position. Too late, he realized the seas were too heavy. The subsequent touch-down and roll-out so damaged his plane that it could not be flown again. A few hours later a storm set in and the plane suffered more damage. Yet for two days Jack Towers—in a magnifiicent display of seamanship—taxied and sailed the flying boat and finally brought it into port at the Azores. One wing pontoon was gone, both lower wings were torn apart, part of the tail had been broken off, and the hull was stove in and leaking.

On another island of the Azores, NC-4 refueled, took off for Portugal and then flew up the continent to London, thereby becoming the first airplane to cross the Atlantic. The congratulatory messages were many. They included one from a young acting secretary of the Navy. His name was Franklin D. Roosevelt.

H. Richard Shea

news

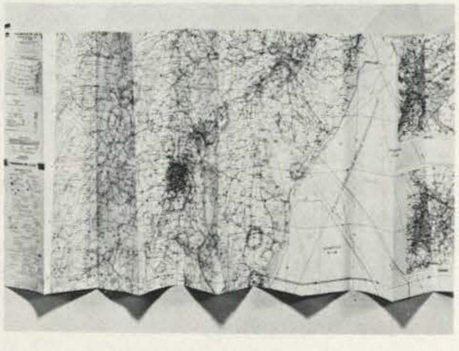
BRIEFS

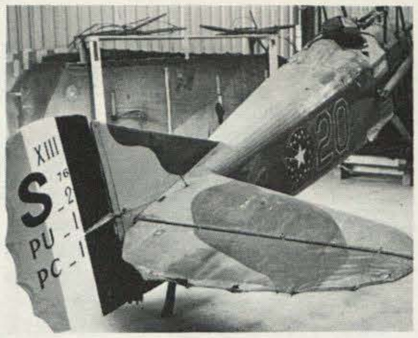
• NEW RULES GOVERNING VFR FLIGHT between 10,000 and 14,500 feet MSL go into effect March 16. On that date, VFR operations in this range will be prohibited unless pilots have at least five miles visibility and can remain at least 1,000 feet vertically and one mile horizontally from cloud formations. These weather minimums are already in effect for VFR flight above 14,500 feet.
The previous minimums for VFR flight below 14,500 feet were 1,000 feet above clouds, 500 feet below, and 1,000 feet horizontally.

• AIR TRAVEL IS LIGHTEST ON weekends according to FAA statisticians who counted the number of airborne passengers during a sample month in May 1967. Friday was the day people found most convenient to travel on airlines. FAA's study, "Scheduled Air Carrier Flight Activity in the U. S., May 1967" showed 17,009 airline flights scheduled on Fridays. Sunday had 14,458 scheduled flights (15 per cent less), and Saturday had 14,117 on the boards (17 per cent less). Monday through Thursday, scheduled airline flights trailed Friday by only one per cent. The high point in Friday's traffic was reached at 6 p.m. (EST) when 1,152 flights were aloft; the low point came at 3 a.m. (EST) when only 176 flights ranged the night skies.

• FAA's AIRPORT BEAUTIFICATION HONOR ROLL shows steady growth with the addition of Johnson Field, Muncie, Ind., and Nantucket Memorial Airport, Nantucket Island, Mass. The two airports were presented FAA Certificates of Commendation for their spruce-up efforts in connection with FAA's Airport Beautification Awards Program which began last summer. This brings to nine the number of airports singled out for honors.

• NUMBER 5 IN THE SERIES of 37 new, improved aeronautical charts covering the contiguous U. S. went on sale last month. Designated the Jacksonville Chart, it covers northern Florida and southern Georgia. Four more new charts are scheduled for publication before summer: New Orleans and Houston should be available by early March, San Antonio by mid-April and Brownsville by late June. Already published are charts for Los Angeles, Miami, Charlotte and Washington, D. C. areas.
The entire series is scheduled to be completed by 1969. The new sectionals, published and distributed by the U. S. Coast and Geodetic Survey, sell for 50 cents each. Charts may be obtained by writing to U. S. Coast and Geodetic Survey, C 44, Rockville, Md. 20852. In Alaska they are on sale at all FAA flight service stations and from the Alaska Field Director, Coast and Geodetic Survey, 632 Sixth Ave., Anchorage Alaska 99501.





Above left—Authentically painted WW I fiighter can be flown anywhere in continental U. S. but must display "N" number at least two inches high. Above, right—SPAD used for exhibit or film needs no "N" but must conform to special FAA rules.

FAA DROPS MOST MARKING RESTRICTIONS ON ANTIQUES

Under a new ruling on aircraft markings, effective Jan. 12, 1968, "antiquers" now have what amounts to unrestricted permission to paint and decorate their aeronautical heirlooms exactly as they were in their heyday. They can restore their aircraft's authentic and classic markings in any size, shape, manner and location they desire, including the wing surfaces.

Still required, however, is the aircraft's registration number, painted in figures at least two inches high either on the sides of the tail or the fuselage. Under certain conditions (e.g., a flight plan), planes operated solely for exhibition or for movie or TV production may be flown without any of the required nationality and registration marks, but with any other markings the owner may choose.

In defining the new permissible markings, FAA made an adjustment in the standard for bestowing antique status on a plane. Previously, aircraft certificated before Jan. 1, 1933 were classed as antiques. This also applied to replicas.

The "new" antiques are of more recent vintage. Antiques are now defined as those built 30 or more years ago, regardless of certification date. Replicas of 30-year-old planes continue to be classed with antiques regardless of when built. The 30-year, or older, rule will automatically enlarge the antique airplane group each year.

Antique marked or exhibition aircraft may not be used in air carrier or commercial operation, nor are they permitted to be flown in foreign countries without permission. If the plane is to be flown through an Air Defense Identification Zone it must display temporary standard markings.

All Weather Landing Study Highlights Tech Report List

FAA has added nine new volumes of technical reports to its growing shelf of aviation related literature. The following reports are available for $3 each from the Government Clearing House for Federal Scientific and Technical Information, Springfield, Va. 22151:

- "Control of Birds on and Around Airports" (AD 663 159).
- "A Study of Radar Meteorological Findings Related to Weather Detection and Air Traffic Control" (AD 643 258), tells of improvements in using radar for aircraft detection by reducing weather clutter.
- "Evaluation of a Multiple FM/CW Radio Altimeter Installation" (AD 658 729), reports on a project in which three altimeters were used simultaneously to determine mutual interference effects of terrain characteristics during automatic landings.
- "Photometer Detection Contrast and Visibility of Runway Lighting in Dense Fog" (AD 662 279), describes a specially developed photometric method to study the visibility of runway lighting.
- "An Investigation and Development of an RBDE-4 Quick Recovery Modification" (AD 663 123), details how a quick recovery modification to radar bright display equipment (RBDE-4) returned the system to normal operation rapidly.
- "Backscatter Signature Studies for Horizontal and Slant Range Visibility" (AD 659 469), discusses the use of laser beams to determine visibility along a slant path, such as an aircraft glide path.
- "Evaluation of Radar Video Recorders" (AD 655 635), opens the possibility of using video tape recorders as a tool in air traffic control procedures.
- "SEAL Control, Display and Recording Console" (AD 663 180), describes the use of *S*ignal *E*valuation *A*irborne *L*aboratory as a flight inspection system.
- "All Weather Landing Simulation for Category III Airborne Configuration, Vol. 1, Summary of Studies on Flight Directors and Split Axis Control" (AD 659 529), examines the pilot's role during Cat III approach and landing.

U.S. Air Carriers Post Impressive Flight Safety Records in '67

U. S. certificated route air carriers flying scheduled domestic and international passenger service flew a record 100,000,000,000-plus passenger miles in 1967 and for the 15th consecutive year the passenger fatality rate was less than one person per 100 million-passenger miles.

According to preliminary figures released by the National Transportation Safety Board, eight accidents in 1967 claimed the lives of 226 passengers, for a ratio of .23 fatalities per each 100 million passenger-miles flown. In 1966, with 83,149,620,000 passenger-miles flown, the ratio was .07 per 100 million passenger-miles.

ATS ASSISTED 3,697 PILOTS

The helping hands of the Federal Aviation Administration were kept busy in 1967, as attested to by the 3,697 "flight assists" given to pilots in distress by FAA facilities across the country last year. The 1967 tally represents an increase of 346 over the 1966 total.

Lost pilots figured in 2,219 incidents, while 1,478 flight assists were given for other in-flight emergencies—508 for help in mechanical problems, 412 related to communications or navigation failure, 422 involving bad weather and 136 for pilots with miscellaneous troubles.

The major share of the flight assists, 2,125 were handled by FAA's nationwide network of more than 300 flight service stations. Control towers handled 1,173 flight assists, and air route traffic control centers accounted for 399. Radar was used in 1,146 incidents.

AIR TAXI BUSINESS IS BOOMING

Scheduled air taxi companies grew an impressive 42 per cent last year, increasing their numbers from 116 in 1966 to 165 in 1967.

The vigorous state of this segment of the aviation industry was disclosed in a report made public by FAA last month.

In the scheduled air taxi fleet are 200 single engine and 452 multi-engine piston aircraft, 24 turbine powered aircraft and 9 helicopters—a total of 685 aircraft.

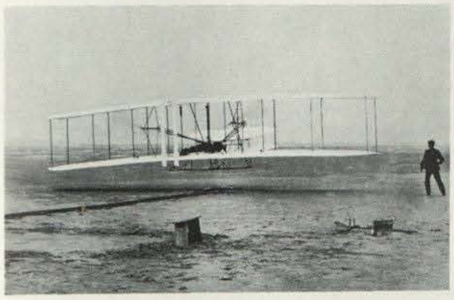
As of November 1967, thirty-two air taxi companies were carrying passengers and mail over 77 routes, none of which competed with routes served by certificated airlines. This will increase to about 200 routes by June 1968, according to Post Office plans. In fiscal year 1967, carrying mail earned $180,000 for air taxi operators; they may earn as much as $8 million in fiscal year 1968.

• Hawk or Flyer?

The craft that the Wright Brothers modeled after their glider #3 and which carried them on that first series of flights into a cold, gusty December wind, they had fondly named *Flyer* —not *Kitty Hawk* as it was named in your November issue's Forum.

Why not spend your next lunch hour at the National Museum where you can brush up on your aviation history?

Seattle



The Wrights seemed to be fond of calling many of their planes "Flyer." They had an unsuccessful "Flyer" in 1902, the 1903 "Kitty Hawk Flyer" and the 1909 "Military Flyer." The Smithsonian advises us that "Kitty Hawk" is the accepted name for the first successful airplane.

• What's the Good Word?

What is the proper phraseology sequence in calling approach control for radar surveillance when flying VFR over a heavy traffic area in marginal weather when equipped with a transponder set at 0600 and a DME? The route would be Farmingdale, L. I. to Teterboro, N. J., over the LaGuardia VOR.

Is it correct to say "12 DME miles LGA. VOR on the 103 radial 0600 destination Teterboro altitude 3,000 over?"

Would the controller know I'm transponder equipped and ask for ident?

Great Neck, L. I.

There is no specific, established phraseology for use by pilots requesting the various forms of radar service available to VFR aircraft. The goal is to provide the required information with a minimum of verbiage. Using the information in your example, we suggest that the following would be appropriate: "12 miles east, 3,000, squawking zero six zero zero, VFR Teterboro, request traffic."

Controllers at terminal radar facilities with transponder decoders are required to monitor code 0600 except when it results in unacceptable radar display clutter. Even though controllers are able to differentiate between primary and beacon reinforced radar targets, it is good practice to inform the controller when you are "squawking" a specific code.

While requesting an "ident" is perhaps the most common device used, controllers have several other methods at their disposal to establish radar identification.

• Have Tool Box, Desire Travel

As international as aviation is today, it seems odd that aircraft mechanic certificates earned in the U. S. are not acceptable when seeking employment by European airlines overseas. Is there any way to get around this, and if so, how should I plan my education to obtain the option of working in the U. S. as well as in Sweden on my future airframe and powerplant certificates?

Minnesotan

Even though mechanic licenses issued by foreign governments are somewhat comparable to the FAA mechanic certificates, there is no reciprocal agreements for international exchange of mechanics' licenses and the privilege of working under their authority.

For answers to specific questions about training and employment requirements in the Swedish aviation industry you might write to: Swedish Board of Civil Aviation, Fack, Stockholm-Bromma 10, Stockholm, Sweden. Or, you might direct a letter to the chief of personnel, Scandinavian Airlines System, Inc., 138-02 Queens Blvd., Jamaica, N. Y.

• Where the Airplanes Are

I am seeking an up-to-date publication which lists all registered civil aircraft in the U. S. What I have in mind is a book about the size of a Sears catalog that gives aircraft type, "N" number, year of manufacture, engine type, etc. In short, the works. Where can I get such a book?

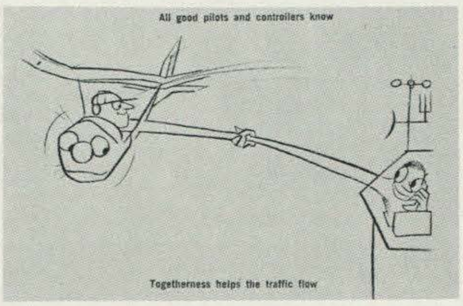
Pennsylvania

The "U. S. Civil Aircraft Register," published twice a year, in January and July, is what you want. You can obtain a copy by sending a check or money order for $7.25 to the Superintendent of Documents, U. S. Government Printing Office, Wash., D. C. 20402.

• The Friendly Aviation Agency

This is a long-overdue note about your people in the El Paso Flight Service Station. This is the most helpful, friendly bunch of guys I have ever met. If I stop in for a little information, they give me a full briefing. If I'm there for a written exam they serve coffee. If I have a few spare minutes and drop by, they give me a grand tour of the station.

I don't know about the fellows in other FSSs but if they are anything like the people



at the El Paso station, you've got a great family.

C. E. Neal
El Paso, Texas

The best way to find out is to visit others of the "family" at the FAA's 342 flight service stations. In the meantime, we'll pass on your kind words to the boys in El Paso.

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

• G.I. Bill Flight Training

In the November issue of FAA AVIATION NEWS under "News Briefs" you have an article about the amendments to the G.I. Bill.

I fill the requirements mentioned, but cannot enroll full time. Will this disqualify me for assistance? If possible, can you provide me with a copy of Public Law 90-77?

Cedar Lake, Ind.

Part-time flight training is authorized but approval is on an individual basis and the study program must meet criteria established by the Veterans Administration.

If you have at least 181 days of military service, any part of which occurred after Jan. 31, 1955, you are eligible for one month of training for each month of service performed after January 31, 1955 up to a maximum of 36 months.

Single veterans are allowed $130 a month in full-time programs; veterans with two dependents are allowed $175, plus $10 a month for each additional dependent.

Since flying training benefits are based on cost rather than hours of enrollment, part-time training presents no problem. The VA pays 90 per cent of the ordinary cost of the training up to the veteran's total eligibility for educational assistance. For each $130 a veteran receives for flight training, his eligibility is charged one month.

Interested veterans should contact their regional VA offices for prompt, detailed information (including full text of Public Law 90-77).

Veterans inquiring about their eligibility should include their VA file number if they have applied previously for VA benefits. For those making initial contact, full name, including middle name, military service number, branch of the service and home address must be given.

Note: two other VA requirements: Must be able to pass a second class FAA medical and have a private pilot certificate or 40 hours of flight training.

• Weather in the Living Room

Can you supply me with more information concerning the "home delivery of aviation weather" via commercial TV as mentioned in the October 1967 FAA AVIATION NEWS? Seems like a terrific idea for adding still another degree of safety in the air, especially since there is a visual presentation along with the vocal.

Fair Oaks, California

All that is needed is a sponsor willing to include a brief resume of aviation weather in a regular weather TV program. The service in the Washington, D. C. area, mentioned in the FAA AVIATION NEWS, is conducted by professional meteorologist. His information is slanted to the private pilot, rather than to professionals, and he always closes with the advice that pilots check with their local FAA flight service station for more detailed briefing. In the Washington area, the aviation portion of the weather is a minute, or less, in duration.

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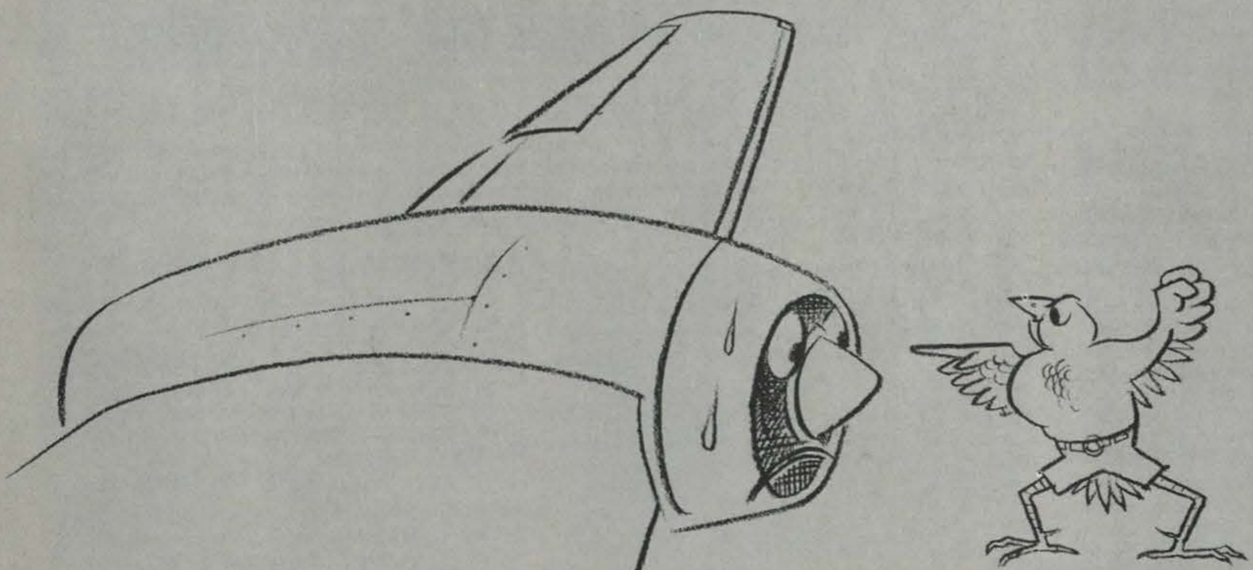

Lotsa' luck!